

Whale Identification, Logging and Display (WILD) Software Development

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LONG-TERM GOALS

The Behavioral Response Studies are intended to collect information which will enable the Navy to minimize negative impact on marine mammals related to sonar and other sources of anthropogenic sound in the marine environment from Navy training operations.

The Whale Identification, Logging and Display (WILD) software is intended to be a solution which provides the situational awareness needed to conduct controlled exposure experiments safely while thoroughly documenting the events and context in which they occur. It must also support typical marine mammal density survey operations. The long term goals for WILD system upgrades and modifications have been based on recommendations made from use on the MED 09 and SOCAL 10 sea trials.

WILD must be a flexible, easy to use software solution that records, integrates and displays visual and acoustic observations of marine mammals, research vessels, sonobuoy locations, and other contextual information relevant to the experiments and their analysis. WILD must also support typical survey, focal follow, and mitigation operations. WILD must have little or no software licensing costs to the user community.

OBJECTIVES

Task 1: Software development, finalize WILD Logger

Task 2: Develop simple internal mapping capability in Logger

Task 3: Software development, finalize WILD Mapper *

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- Task 4: Software development, finalize NMEA Distributor
- Task 5: Create user manual / online help system
- Task 6: Implement version control / configuration management
- Task 7: Create web distribution site.
- Task 8: Provide SOCAL-12 support
- * Task 3 folded into Task 2 to make a more robust internal map

APPROACH

The final development of WILD includes the use of industry standard programming languages and methodologies which result in compiled, easily installed, royalty free software. Planned upgrades and modifications to the WILD software were made based on lessons-learned from visual observers and Chief Scientist on the SOCAL-10, SOCAL-11, and SOCAL12 cruises and communication with observers who have worked on these projects.

WORK COMPLETED

The WILD Logger and Mapper programs were integrated with mapping capability now being provided natively using a Visual Studio ® GIS and mapping extension development tool purchased from ThinkGeo. The maps can be customized by including ESRI ® features from shapefiles or personal Geodatabases or some raster files. This allows users to include track lines for surveys, Navy OPAREAs, bathymetry, land and other useful contextual features. By dropping the ESRI ArcMap requirement the software is now a wholly owned product of the Navy and can be distributed without royalty or copyright considerations and can be operated from a single simple application.

The program has been modified in several additional ways to enhance its usability and flexibility. WILD can now be configured for networked, multiple user input. This permits any number of users to independently log observations and all maps are updated in real time. This allows for all parties to maintain situational awareness in Surveys, Focal Follow and tagging operations and behavioral Response experiment scenarios.

WILD has undergone a major transformation from the WILD Logger and WILD Mapper to one integrated application. Many features have been added or enhanced. These include:

Integrated map: ESRI ® ArcMap and associated licensing are no longer required for real time visualization. The map is now simply another tab on the application (see figure 1). The map is simpler to use requiring little knowledge of Geographic Information Systems (GIS) or mapping. Flexibility is maintained by providing the user with the ability to include map layers of their choice from ESRI ® shapefiles, personal geodatabases, and some raster formats. Features on the layers can be labeled and layers can be added, removed and turned on and off as desired.

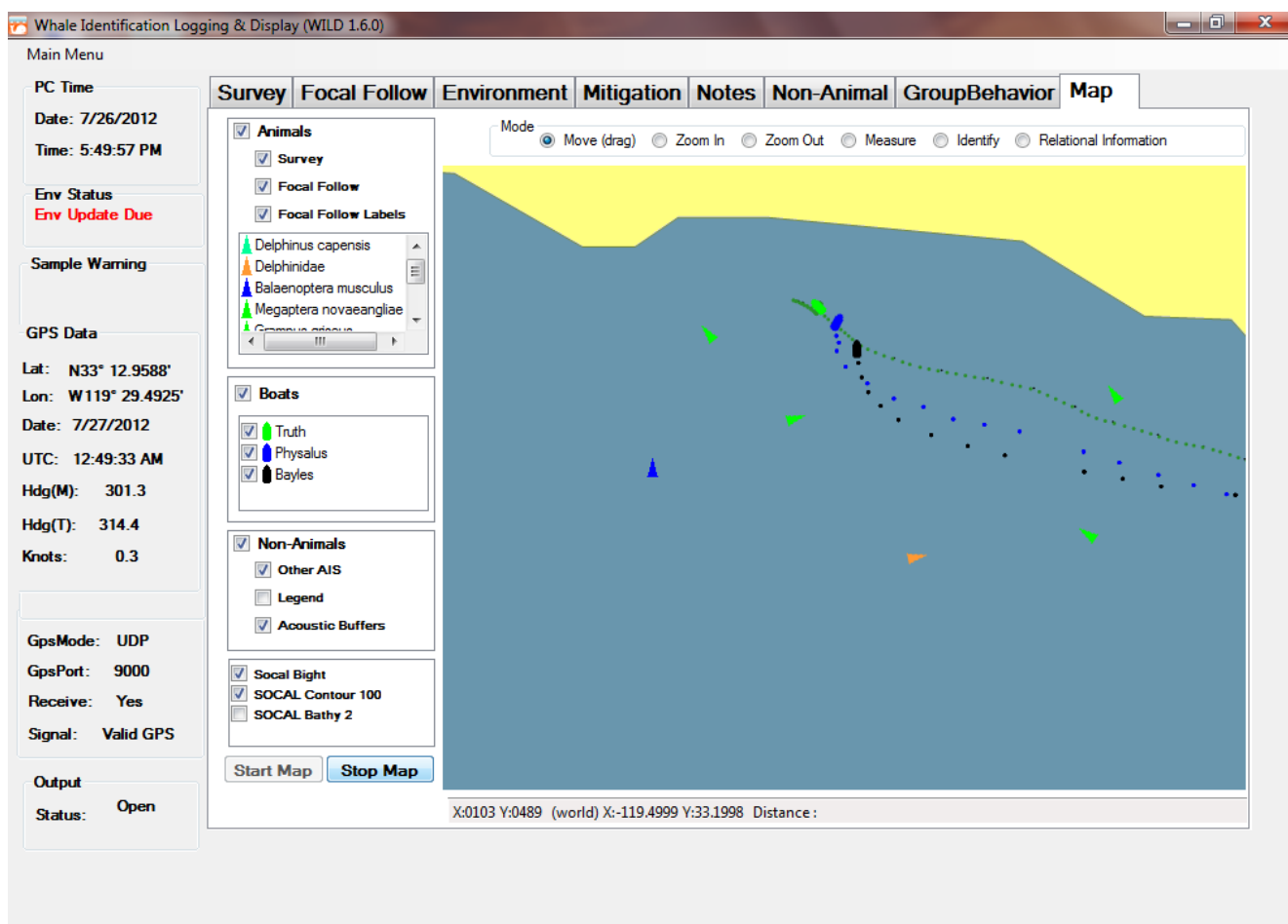


Figure 1. WILD map tab. Each of the three vessels has a track associated with it. The animal observations are represented by the colored triangles pointing in the direction of travel of the animals. The green vessel is the main research platform. The blue vessel is one of the two tag RHIBS and the black vessel is the passive acoustic monitoring platform.

The map provides improved functionality while being much simpler to operate. All of the map movement functions are controlled by the radio buttons across the top of the map including navigation and identification functions. In all modes the wheel on the mouse allows easy zoom in and zoom out functionality. The measure tool reports the distance between objects and the true bearing angle between them. The relational tool provides all of the information of any two selected observations as well as the distance and angle between them and the time between the observations.

In addition to the new map the WILD Survey, Focal Follow, Mitigation and Non Animal observation logging forms permit full editing (see Figure 2). All edits update the appropriate record in the database and, if the edit would result in a change to the map, a new custom sentence is generated to do so. The mapping portion of the program determines the sentence is an update and the old symbol is removed and a new symbol generated to reflect the update. For instance if it was determined a species was misrepresented in a previous observation (a common occurrence) the observation can be changed and the color of the symbol on all maps will be updated to reflect the change.

Whale Identification Logging & Display (WILD 1.6.0)

Main Menu Help

PC Time
Date: 9/28/2012
Time: 10:34:33 AM
Last Env. Save Time: 10:31:36 AM
Sample Warning

GPS Data
Lat: N32° 34.9571'
Lon: W117° 7.7989'
Date: 9/28/2012
UTC: 5:34:28 PM
Hdg(M): 224.4
Hdg(T): 237.3
Knots: 0
GpsMode: UDP
GpsPort: 5000
Receive: Yes
Signal: Valid GPS
Output
Status: Open

Survey Focal Follow Environment Mitigation Notes Non-Animal GroupBehavior Map

New Event Edit

PLATFORM GPS INFORMATION
Date Time Latitude Longitude Hdg(M) Hdg(T) Speed(Kt)
9/28/2012 3:47 PM 32.58262 -117.12996 223.9 236.8 0

Survey# 1 Observer Annie Douglas

ANIMAL LOCATION
Bearing Reticle Range(m) Binoculars Conversion Factor Aspect
40 0.5 4172 Steiner 15X80 0.059 11=330deg

Calc'd Animal Position
LAT 32.58707
LON -117.17421
206.8

ANIMAL OBSERVATIONS
Species Confidence Cue Initial Behavior
Physeter macrocephalus High Back Logging/rest

GROUP SIZE
Low Best High
2 2 2

GROUP COMPOSITION
Unknown 0 Males 0 Females 1
Und Adult 0 Juv 1 Calves 0 Newborns 0

General/Dominant Behavior
Logging/rest

Mixed Group Mixed With(Species) Number of Animals Mixed With Surf#
Yes Delphinidae 1 of 2

Load GPS End Time
End Time 9/28/2012 3:50 PM

Notes:
Save Clear All

Figure 2, The Survey tab. Note the addition of navigation controls on the lower right hand side of the form. The platform information at the top of the form is grayed out indicating it cannot be edited. All other aspects of the observation can be changed. If the change would result in a change in appearance on the map, an update on all maps would occur.

The NMEA Distributor has been finalized and still provides the ‘building block’ of the communications for WILD (Figure 3). This tool is what allows for the integration of multiple loggers in addition to other data feeds of interest including acoustics and tag boat locations. WILD will work in a ‘stand alone’ mode also where only a gps/compass is necessary. Any multiuser scenario requires use of NMEA distributors to collect and integrate all events and observations of interest into a single data feed for mapping. The NMEA Distributor is a stand alone application and contains it’s own help system.

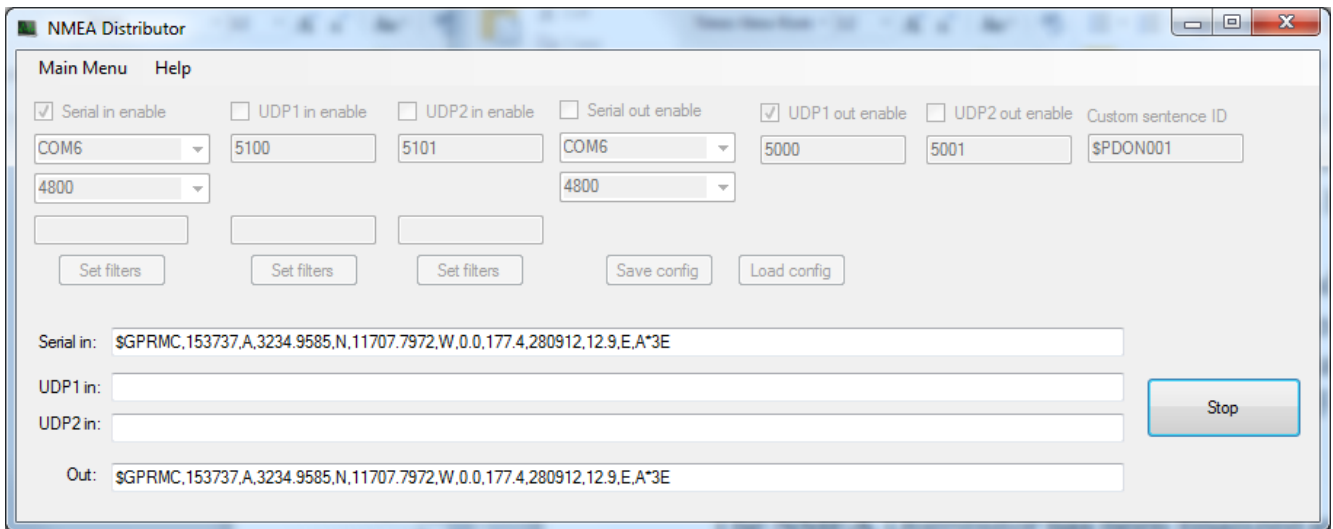


Figure 3, the NMEA distributor. In this illustration an NMEA Distributor is being used to capture the signal from the GPS (device on comm 6). The output from the GPS is filtered and only the desired sentences are rebroadcast on the network on UDP port 5000 in this example.

Any number of NMEA Distributors can be instantiated to connect any number of instruments into the ship's data stream. Each one merging another instrument or vessel feed into the stream. The configuration of the distributors can be saved in an XML file so it can easily be reloaded. A total of four such NMEA Distributors were used to integrate all data into one broadcasted stream in the SOCAL-12 leg 1 configuration (Figure 4)

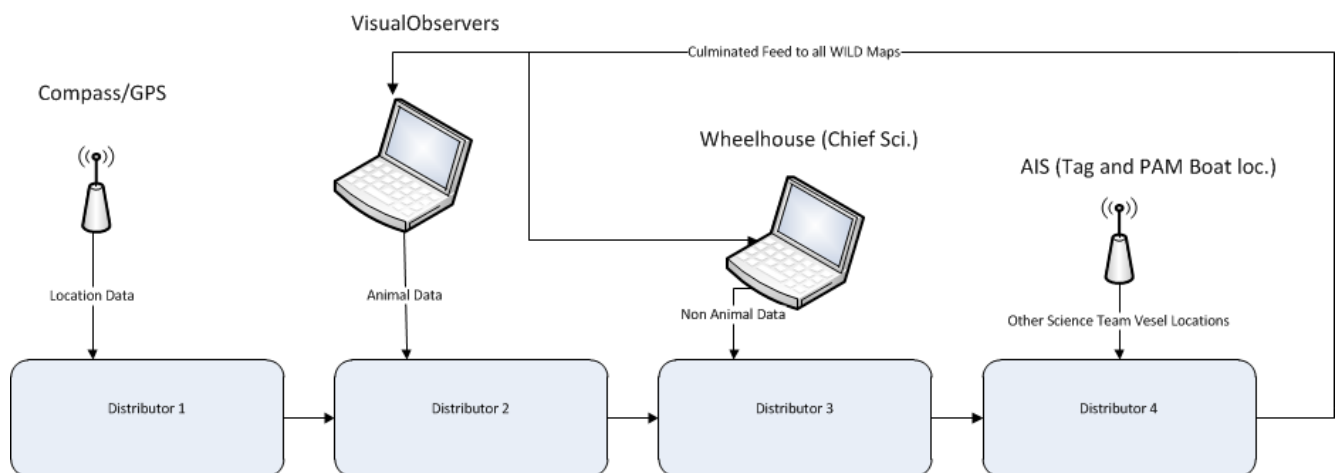


Figure 4, WILD and NMEA Distributor configuration used for SPCAL-12 BRS Leg 1. The same configuration will be used for Leg 2. Each distributor integrates a data source into the feed and passes it on to the next. The final feed contains all information sources and is used by the mapping element to render all spatial events regardless of where they were generated in real time.

Figure 5 below shows WILD being used on the SOCAL-10 BRS providing the Chief Scientist the decision support needed to successfully conduct a playback on a tagged marine mammal. The data collected from these tags helps provide a better understanding of the animal's response to anthropogenic sound.

WILD Configuration on the Vessel Truth

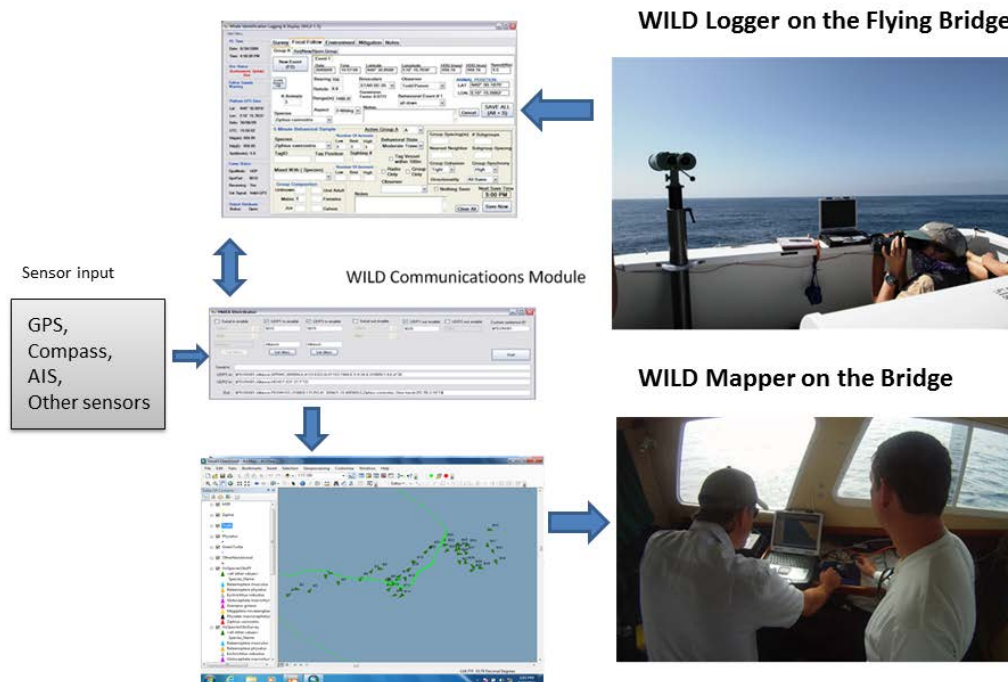


Figure 5, WILD components supporting the SOCAL-11 BRS. Note the mapping portion illustrated here has been replaced by a map fully integrated into the WILD Logger which underwent preliminary testing during Leg 1 of SOCAL-12 BRS. This change permitted the wheelhouse instance of WILD to log sonobuoy and acoustic source deployments thus reducing the workload on the flying bridge.

Creation of the Help system for the WILD Logger application is underway. The help system from within the application will cover setup and use of WILD and will be in a standard Windows .chm file format. Similar content will appear on the web distribution site also currently under development.

Software Configuration Control will be formally initiated with the final release of WILD.

RESULTS

At Sea Support, Leg 1 SOCAL-12

Chris Kyburg participated in the first leg of the SOCAL-12 BRS. WILD was successfully used throughout the first leg of the SOCAL-12 Behavioral Response Study (BRS). WILD provided tactical decision support for all playbacks performed on the leg. As well as standard observation logging. WILD was successfully used in full networking mode for the entire cruise. A division of effort was established between the Flying Bridge and the Wheelhouse whereby the wheelhouse would take on the

effort of logging sonobuoy, XBT and Acoustic Source deployments and operations freeing the flying bridge personnel to focus on marine mammal observations. Both displays were able to show all events in real time.

Release of the NMEA Distributor and WILD Logging applications will occur this calendar year

IMPACT/APPLICATIONS

[Potential future impact for science and/or systems applications]

TRANSITIONS

WILD is to be transitioned to Navy use in beta form on Leg 2 of the SOCAL-12 BRS on Oct 10 2012. Provided all goes as expected the release to the Navy at large and the public will occur on Dec 31 2012. Interest has been expressed by NAVFAC, PACFLEET, New England Aquarium among others.

RELATED PROJECTS

This project has and continues to be related to the SOCAL BRS project, the 5 year fieldwork intended to better understand marine mammals reaction to anthropogenic sound. WILDs development has been influenced extensively by the needs of this project and previous similar projects including BRS-08 in the Bahamas and MED-09 in the Medeterranean Sea.